Water Quality Analysis

Loop 1604 Schematic Design from SH 16 to I-35

Bexar County, Texas

Prepared for TxDOT

CSJ: 2452-02-083; 2452-03-113; 2452-03-087

May 2020

The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried-out by TxDOT pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated December 9, 2019, and executed by FHWA and TxDOT.

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1. INTRODUCTION

This preliminary water quality analysis report is prepared for use by the Texas Department of Transportation (TxDOT) in coordination with the development of the schematic design of Loop 1604, from SH 16 to I-35 and includes the interchange with I-10 in San Antonio, Texas. This study estimates the current pollutant load removal achieved by the existing water quality control facilities, summarizes the requirements for pollutant load removal for the proposed project, and recommends required improvements to ensure compliance with current water quality regulations. The information and approach presented herein may change based upon the final design.

2. PROJECT DESCRIPTION

The existing Loop 1604 facility primarily consists of two 12-foot-wide mainlanes in each direction, with 4-foot-wide inside and 10-foot-wide outside shoulders, separated by a 36- to 64-foot-wide grass ditch median. These lanes operate as a controlled access facility with mainline access gained through ramps from the frontage roads between cross streets. The existing Loop 1604 right-of-way varies from 330 to 550 feet in width.

The proposed project would expand Loop 1604 from a four-lane expressway to a ten-lane expressway. The proposed project would include two high-occupancy vehicle (HOV) special purpose lanes (one in each direction) and eight general-purpose lanes (four in each direction). The proposed improvements include continuous sidewalks and bicycle accommodations along the entire length of the project. No new right-of-way or permanent easements would be required.

3. REGULATORY REQUIREMENTS

The Texas Commission on Environmental Quality (TCEQ) regulates development within the Contributing, Transition and Recharge Zones of the Edwards Aquifer. The Edwards Aquifer Recharge Zone provides water to numerous communities and provides a habitat for endangered species. The project is largely located within the Recharge Zone and is subject to the TCEQ Edwards Aquifer Protection Program (EAPP) regulations.

Chapter 213, of the Texas Administrative Code (TAC) states that, “Best Management Practices (BMPs) and measures must be implemented to control the discharge of pollution from regulated activities after the completion of construction. These practices and measures must be designed, constructed, operated, and maintained to ensure that 80 percent of the incremental increase in the annual mass loading of total suspended solids from the site caused by the regulated activity is removed. These quantities must be calculated in accordance with technical guidance prepared or accepted by the executive director.” This evaluation follows the Texas Commission on Environmental Quality’s (TCEQ) Complying with the Edwards Aquifer Rules: Technical Guidance for Best Management Practices, RG - 348, 2005., to ensure that new construction activities provide stormwater mitigation measures compliant with the Edwards Aquifer rules and regulations outlined in Chapter 213 of the TAC.

This document describes in detail the selection of permanent, structural and non-structural BMPs to provide treatment for 80 percent of the incremental increase in Total Suspended Solid (TSS) caused by the proposed impervious cover on the LP 1604/I-10 project.

4. WATER QUALITY ANALYSIS

4.1 Study Area

The study area includes the proposed project construction area and project right-of-way (ROW) located within the Edwards Aquifer Recharge Zone. Approximately 20 miles of the proposed expansion lies within the Edwards Aquifer Recharge Zone (see **Appendix A**). There are areas within the ROW, located within the Edwards Aquifer Transition Zone, that drain back into the Recharge Zone. These areas are also included in the study area to ensure proper treatment is provided for compliance. The Critical Habitat Unit 9 (CHU 9) was also reviewed closely to ensure contaminants do not compromise the water quality of this sensitive area. The area encompassing CHU 9 is shown on **Appendix D**.

4.2 Watersheds

Three major watershed areas have been identified within the proposed study area: Leon Creek Watershed, Salado Creek Watershed, and Upper San Antonio River Watershed (see **Appendix A**). Minor BMP watersheds lie within major watersheds and indicate runoff areas which can potentially be captured and diverted to a water quality BMP. Existing culvert crossing outfalls have been identified to determine the discharge point for each BMP. The discharge point is where the BMPs will ultimately outfall and potentially enter the aquifer.

The required total suspended solids (TSS) removal, in pounds (lbs.), was determined for each major watershed and for each culvert discharge point. The actual TSS removal was determined for each BMP watershed and for each culvert discharge, using the associated efficiencies for each BMP.

If opportunities are not available to treat the required TSS load within a culvert (minor) watershed, overtreatment in an adjacent culvert (minor) watershed is considered as a viable alternative, as long as the adjacent (minor) watershed is within the same major watershed.

4.3 Existing Conditions

Several existing water quality BMPs are located within the proposed project limits. For this evaluation, the existing BMPs were identified and existing TSS removal loads were determined using roadway as-built plans, Water Pollution Abatement Plans (WPAPs), and TxDOT's Geographical Information Systems (GIS) shape file for existing BMP inventory (SanAntonio_SC.shp).

The proposed LP 1604 mainlane widening and reconfiguration of the ramps would remove the majority of the existing BMPs. The existing TSS load removals from the affected BMPs will be compensated and accounted for in the proposed design.

The roadway development is classified into two categories: pre-1999 (i.e. pre-TCEQ regulations) and post-1999 (i.e. post-TCEQ regulations). There have been eight WPAPs submitted and approved for LP 1604 and I-10 that are considered as post-1999 development. The impervious cover increases for the post-1999 development were acquired either from WPAPs or survey measurements. The actual and required TSS removal loads were either acquired from the WPAPs or calculated with the available information.

The water quality ponds at watersheds S (Salado Creek) and AG (Mud Creek) did not have sufficient information to accurately determine the actual TSS removal. It was assumed that the TSS removal required was based on 50 percent impervious cover increase when it was originally constructed. See **Appendix C** for the pond calculation with assumptions provided. **Table 1** summarizes the information gathered from all sources provided.

Table 1: Summary of Impervious Cover Increase, TSS Removals, and Treatment Methods Along LP 1604

CSJ	WPAP Ref ID	Project Limits	Impervious Cover Increase (ac.)	Total Required TSS Load Removal (lbs)	Total Actual TSS Load Removal (lbs)	Treatment methods provided
2452-02-082	1311103110	TxDOT - Vance Jackson Bridge over LP 1604	0.46	375	375	vegetative filter strip
2452-02-118	13000663; RN102758182	TxDOT- LP 1604 & FM 1535 Turnaround	0.37	302	344	vegetative filter strip
2452-02-119	13000664; RN102758182	TxDOT - LP 1604 & Huebner Rd	3.45	3.689	3,742	vegetative filter strips and grassy swales
0253-04-139	13-10090211	ARMA- US 281 & LP 1604- Bitters Rd. to Redland Rd.	18.53	12,414	21,373	vegetative filter strips, grassy swales, Aqualogic
2452-02-061	00101201A	TxDOT- LP 1604 - FM 1535 to Bitters Rd.	11.21	9,151	17,200	Aqualogic
0253-04-146	13000320 RN109458919	US 281 - LP 1604 to Stone Oak Pkwy	0.78 [1]	742	2,111	vegetative filter strips, grassy swales, water quality pond
2452-03-070	not available [3]	LP 1604- US 281 to Mud Creek	11.3 [2]	9,225	17,500	water quality pond
2452-02-064	13000836 RN110607827	LP1604- SH 16 to Hausman Rd.	1.48	1,966	1,751	grassy swale
2452-03-118	13000654 RN104209911	LP 1604- Redland Rd. to Bulverde Rd.	3.72	3,297	3,297	vegetative filter strips
TOTAL			51.3	41,161	67,693	

[1] Impervious cover increase information provided from available as-builts.
[2] Impervious cover increase based on treatment volume provided and 50 percent impervious cover increase assumption.
[3] Predates EAPP rules and case number assignments (1992).

The cumulative TSS removal load available from the existing BMP's along LP 1604 is 67,693 lbs. An approximate total of 51.3 acres of impervious cover has been added since 1999. The TCEQ regulations require treatment for 80 percent of the impervious cover increase. The required TSS removal for the additional impervious cover is 41,161 lbs. For this analysis, compensation will be provided for the 41,161 lbs. of TSS removal required for the post-1999 increase in impervious cover. See **Appendix B** for a detailed listing of the existing BMPs and information provided from the available WPAPs and calculations.

Table 2 lists the available WPAPs and roadway as-builts and the associated impervious cover increase along I-10. See **Appendix B** for a detailed list of BMPs and calculations for all BMPs identified in as-builts and WPAPs. See **Appendix D** for locations of the existing BMPs within the ROW.

Table 2: Summary of Impervious Cover Increase, TSS Removals, and Treatment Methods Along I-10

CSJ	WPAP Ref ID	Project Limits	Impervious Cover Increase (ac.)	Total TSS Load Removal Required (lbs)	Total TSS Load Removal Actual (lbs)	Treatment methods provided
0072-07-041	13000385	I-10- FM 3351 to La Cantera Pkwy	5.68	4,635	7,791	vegetative filter strips
0072-08-121	13-08090810	I-10 - EB Frontage Rd at Leon Creek	1.54	73	77	vegetative filter strip
TOTAL			7.22	4,708	7,868	

The cumulative TSS removal load available from the existing BMPs along I-10 is 7,868 lbs. A total of 7.22 acres of impervious cover has been added since 1999. The TCEQ regulations require treatment for 80 percent of the impervious cover increase. The required TSS removal for the additional impervious cover is 4,708 lbs. For this analysis, compensation will be provided for the 4,708 lbs. of TSS removal required for the post-1999 increase in impervious cover. See **Appendix B** for a detailed listing of the existing BMPs and information provided from the available WPAPs and calculations.

The existing required TSS removal was reviewed for each major watershed. **Table 3** lists the existing TSS removals required for each major watershed. CHU 9 is located within the Leon Creek watershed (BMP area J) and does not have any current BMPs in place to provide water quality treatment.

Table 3: Summary of Existing TSS Removal Required For Each Major Watershed

Watershed ID	Existing Required TSS Removal (lbs.)
Salado Creek	37,924
Upper San Antonio River	302
Leon Creek	6,158
TOTAL	44,384

4.4 Proposed BMP Analysis

For the proposed BMP analysis, the increase in impervious cover was measured and used to calculate the TSS removal goals for each major watershed and for each culvert discharge watershed. Impervious cover overlaps from bridges were also included the measurements to ensure that all TSS was properly accounted for.

The required TSS load removal for each watershed is as follows:

TSS Removal Required from **80 percent of proposed impervious cover increase**
\+ TSS Removal Required **from the existing BMPs**
\+ 10 percent additional for **future design changes**
= **TOTAL TSS Removal Required**

4.5 Proposed Treatment Methods

For the proposed conditions evaluation, vegetative filter strips, grassy swales, and concrete-walled sand filter ponds are considered to be the preferred treatment method. Earthen-walled basins were not considered during this analysis, as they would have a larger footprint and require more maintenance than concrete basins.

Due to their high removal efficiency and relatively low cost, vegetative filter strips were utilized wherever possible along the frontage roads and ramps by providing 15 feet (ft.) wide, 5:1 side slopes adjacent to the new pavement edges. Grassy swales were also included in areas where space was available for wide and flat ditches (<0.5 percent grade) that could achieve the required removal rates.

Water quality sand filter ponds were added in open areas within the ROW. They were sized to treat as much of the required area as possible, within the available space provided. In some instances, they were not sized for optimal efficiency, but still provided as much treatment as needed to meet the TSS removal requirements. In most cases, 5 ft. deep ponds were used. Outfall elevations were verified by comparing the cross culvert flowline with the proposed outfall at the pond.

In areas where space was limited, underground wet vaults were proposed along the storm sewer system. Proprietary items such as Aqualogic, Baysaver, and StormFilter have been used extensively in previous projects, so these items are considered preferred methods for underground treatment. It will be up to the PS&E designer to determine the best proprietary water quality device to use for the project. For the schematic design analysis, wet vaults were proposed in tight areas because of their small footprint and high efficiency. See **Exhibit B** for proposed BMP locations.

4.6 Assumptions

The following assumptions have been made for the development of this analysis:

- Several existing hazardous materials traps are located throughout the project limits. Compensation for removal of the traps will not be provided for TSS removal purposes. However, a valve system should be included in proposed BMP systems that would ultimately replace the functionality of the existing hazardous materials trap. See **Appendix B** for a list of the existing hazardous materials traps along LP 1604 and I-10. **Appendix D** shows the locations of the existing hazardous material traps.
- An additional 10 percent of required TSS removal will be applied to consider future design changes.
- It is not always possible or practical to intercept and collect runoff from all portions of the watersheds; therefore, it is assumed that, as long as the overall removal goal is met for a major watershed, some areas may discharge water that is not treated.

- BMP area J, which contains CHU 9, will be overtreated to provide much greater treatment than the 80 percent impervious cover increase treatment that TCEQ requires. It is recommended to provide treatment for 100 percent of the impervious cover increase as well as 33 percent of the existing impervious cover. This will help satisfy any regulatory requirements for this sensitive environmental area.
- Several proprietary wet vaults can achieve varying levels of removal efficiencies (80 to 93 percent), depending the on type of device used and the amount of runoff entering the device. A general 85 percent BMP efficiency was used on all wet vaults to conservatively account for the varying efficiencies.

4.7 Results

As a result of the proposed improvements along LP 1604 and IH 10, the overall impervious cover increase was 236 acres within all zones of the Edwards Aquifer. The proposed impervious includes all roadway surfaces and roadway decks surfaces. The proposed BMPs provided for the preliminary water quality analysis will result in 283,046 lbs of TSS removal for the total project limits within the Recharge, Contributing, and Transition Zones draining into the Recharge Zone. This total results in a proposed overtreatment by removing an additional 20,879 lbs of TSS loads.

See **Table 4** for the TSS Removal Required Summary for each major watershed. See **Appendix C** for the detailed proposed BMP analysis and calculations. See **Table 5** for a summary of the impervious cover increase for each Edwards Aquifer Zone.

Table 4: Summary of Proposed TSS Removal Required and Overtreatment Provided

Watershed ID	Existing Required TSS Removal (lbs.)	Proposed Required TSS Removal	Proposed Actual TSS Removal (lbs.)	Proposed Overtreatment (lbs.)
Salado Creek	37,924	134,926	139,521	4,595
Upper San Antonio	302	17,934	20,104	2,169
Leon Creek	6,158	109,306	123,421	14,115
TOTAL	44,384	262,166	283,046	20,879

Table 5. Summary of Impervious Cover Increase

Watershed ID	Area Within Project Limits (ac)	Existing Impervious Cover (ac)	Proposed Impervious Cover (ac)	Impervious Cover Increase (ac)
Recharge Zone	875	530	727	198
Contributing Zone within the Recharge Zone	110	80	83	3
Transition Zone draining into the Recharge Zone	105	70	105	35
TOTAL	1,090	680	916	236

The Critical Habitat Unit 9 (CHU 9) area was overtreated to provide treatment for 100 percent of the impervious cover increase as well as 33 percent of the existing impervious cover to minimize contaminants entering the

sensitive environmental area. This is much greater than the 80 percent impervious cover increase treatment that TCEQ requires.

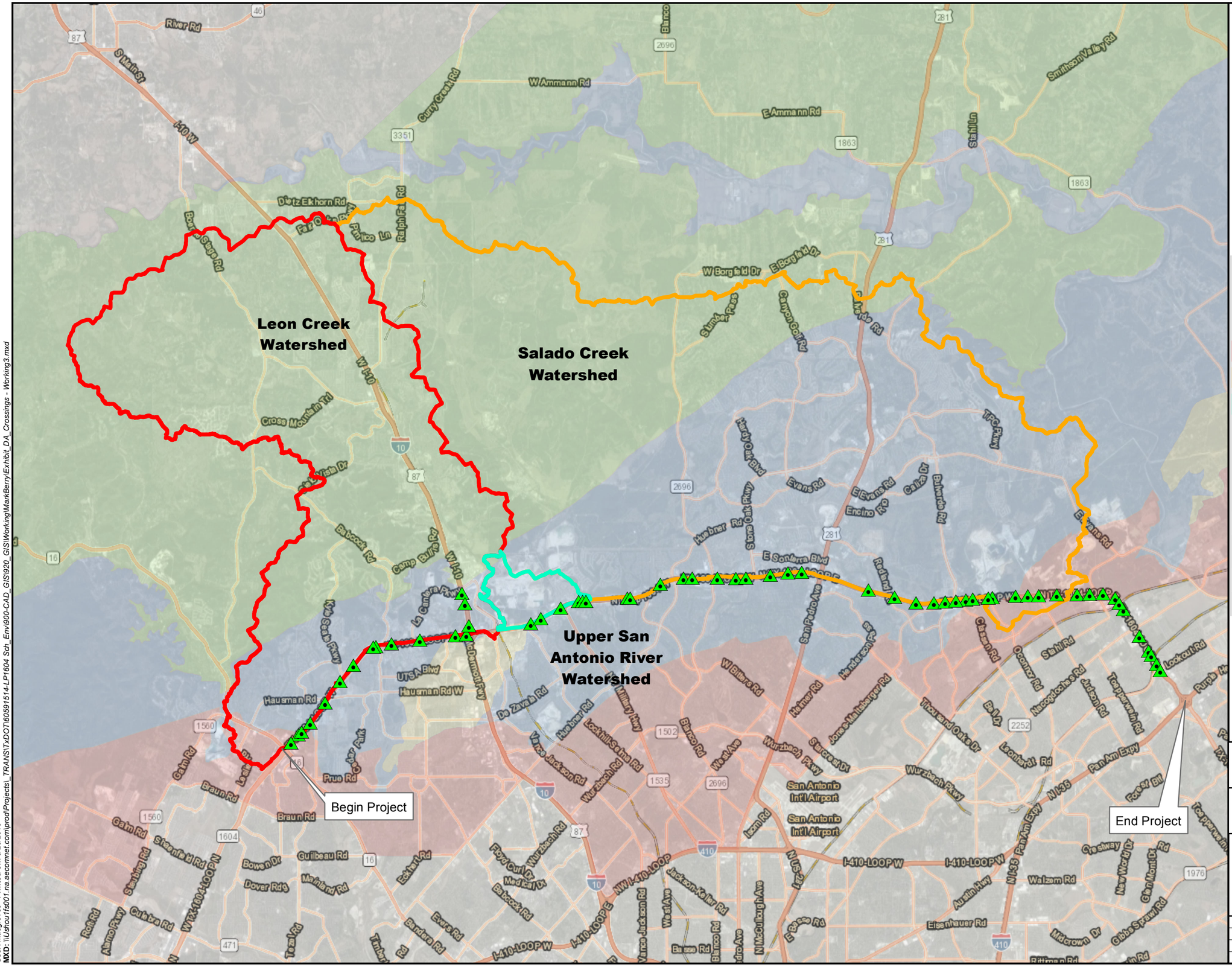
The TSS produced from existing impervious cover conditions are 25,979 lbs. The proposed TSS produced from proposed conditions are 40,433 lbs. The proposed BMPs recommended are 3 wet vaults and 2 sand filter ponds, which will remove 23,017 lbs. of TSS. This will result in an overall TSS production of 17,415 lbs., which is approximately a 33 percent reduction from existing conditions.

5. CONCLUSIONS

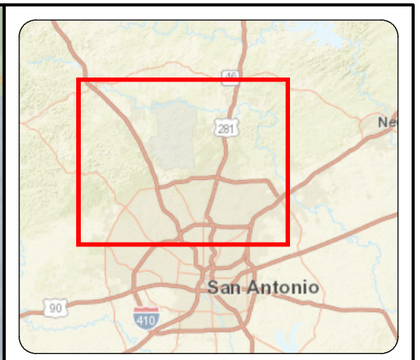
The proposed water quality controls for the project have been designed to meet all TCEQ EAPP requirements. Any sensitive features encountered during construction will be addressed in conformance to Chapter 213.5 of the TAC. It is recommended that a combination of vegetative filter strips, grassy swales, wet vaults, and sand filter ponds be designed as the permanent water quality controls for the LP 1604/I-10 project. By providing a combination of the aforementioned BMPs, the project will be able to meet the TSS removal required by the TCEQ.

APPENDIX A

EXHIBIT A: MAJOR WATERSHED BOUNDARIES AND EDWARDS AQUIFER ZONES



Vicinity Map



LEGEND

Drainage Crossings

Watershed Boundaries

- Leon Creek Watershed
- Salado Creek Watershed
- Upper San Antonio River Watershed

Aquifer Zones

- Contributing Zone
- Recharge Zone
- Transition Zone
- Contributing Zone within the Transition Zone

0 1 2 Miles

N

Date of Aerial: 2018

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Loop 1604 Schematic Design
From SH 16 to IH 35
Exhibit A
Major Watershed Boundaries
and Edwards Aquifer Zones

SHEET 1 OF 1

FED. RD. DIV. NO.	STATE	CONTRACT NO.			HIGHWAY NO.
6	TEXAS	15-8IDP5007 WA 1			LP1604
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	EXHIBIT NO.
SA	BEXAR	0500	03	601	2

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APPENDIX B

EXISTING BMP INVENTORY AND CALCULATIONS

LP 1604 - EXISTING WATER QUALITY BMP INVENTORY AND CALCULATIONS

Major Watershed	Culvert Watershed ID	BMP ID	WPAP Report Number	TxDOT ID	Inside ROW Limits?	Station	Offset	RT/LT	Type	Contributing Drainage Area (ac)	Total Existing Impervious Cover (ac)	Total Proposed Impervious Cover (ac)	Total Increase in Impervious Cover	Total Load Removal Required (lbs)	Total Load Removal Actual (lbs)	BMP Efficiency (%)	Disturbed/To remain in place	NOTES
CSJ 2452-02-082																		
Leon	L	VEG STRIP 1	13-11103110	3	Y	4083+13.52	58.94	LT	VFS	0.67	1.5	1.54	0.46	375	375	85	To Be Removed	
CSJ 0253-04-118 (WPAP 13000663; RN102758182)																		
UpperSA	O	VEG STRIP 2	13000663; RN102758182		Y	4171+35.65	142.82	LT	VFS	27.67	0.8	1.17	0.37	302	344	85	To remain	Missing element in SanAntonio_SC.shp
CSJ 0253-04-119 (WPAP 13000663; RN102758182)																		
Salado	S	VEG STRIP 3	13000664; RN102758182		Y	4259+95.06	134.16	RT	VFS	0.54	5.6	9.05	3.45	3689	3742	85	Disturbed	Missing element in SanAntonio_SC.shp
Salado	S	GRASSY SWALE 2	13000664; RN102758182		Y	4259+95.06	129.16	RT	GS	1.40						70	Disturbed	Missing element in SanAntonio_SC.shp
Salado	U	GRASSY SWALE 3	13000664; RN102758182		Y	4270+63.09	141.01	LT	GS	1.21						70	To Remain	Missing element in SanAntonio_SC.shp
Salado	U	VEG STRIP 5	13000663; RN102758182		Y	4270+91.32	132.56	RT	VFS	0.82						85	To Remain	Missing element in SanAntonio_SC.shp
Salado	U	VEG STRIP 8	13000664; RN102758182		Y	4298+12.91	120.11	RT	VFS	0.34						85	To Remain	Missing element in SanAntonio_SC.shp
Salado	U	VEG STRIP 9	13000664; RN102758182		Y	4301+37.12	156.30	LT	VFS	0.23						85	To Remain	Missing element in SanAntonio_SC.shp
Salado	W	VEG STRIP 10	13000664; RN102758182		Y	4303+21.27	163.22	LT	VFS	0.40						85	To Remain	Missing element in SanAntonio_SC.shp
Salado	W	VEG STRIP 11	13000664; RN102758182		Y	4310+17.15	147.10	RT	VFS	0.54						85	To Remain	Missing element in SanAntonio_SC.shp
CSJ 0253-04-139 (WPAP 13-10090211)																		
Salado	U	VEG STRIP 6	13-10090211	84	Y	4287+73.90	114.59	LT	VFS	0.39	0.36	0.39	0.03	292	344	85	To Be Removed	
Salado	U	VEG STRIP 7	13-10090211	210	Y	4290+83.45	19.23	RT	VFS	2.20	7.58	8.56	0.98	392	2768	85	To Be Removed	
Salado	W	GRASSY SWALE 4	13-10090211	46	Y	4335+69.19	93.32	RT	GS	2.25						70	To Be Removed	
Salado	Y	VEG STRIP 12	13-10090211	47	Y	4369+56.55	122.37	RT	VFS	0.44	3.65	4.56	0.91	756	756	85	To Be Removed	
Salado	Y	GRASSY SWALE 5	13-10090211	48	Y	4369+75.70	84.88	RT	GS	0.94						70	To Be Removed	
Salado	Z	VEG STRIP 13	13-10090211		Y	4381+95.93	92.00	LT	VFS	0.35	1.8	2.18	0.38	41	1092	85	To Be Removed	Missing element in SanAntonio_SC.shp
Salado	Z	VEG STRIP 14	13-10090211	208	Y	4388+50.86	3.67	RT	VFS	0.41						1	To Be Removed	
Salado	Z	GRASSY SWALE 6	13-10090211	207	Y	4385+46.32	81.50	LT	GS	0.58						70	To Be Removed	
Salado	AA	VEG STRIP 15	13-10090211	49	Y	4394+56.54	68.31	RT	VFS	0.84	0.5	0.65	0.15	175	362	85	To Be Removed	
Salado	AB	GRASSY SWALE 7	13-10090211		Y	4410+73.46	113.16	RT	GS	0.82	11.69	14.06	2.37	1934	2497	70	To Be Removed	Missing element in SanAntonio_SC.shp
Salado	AB	VEG STRIP 16	13-10090211		Y	4409+01.42	68.51	LT	VFS	0.63						85	To Be Removed	Missing element in SanAntonio_SC.shp
Salado	AB	GRASSY SWALE 8	13-10090211	76	Y	4425+70.04	64.69	LT	GS	1.42						70	To Be Removed	
Salado	AB	GRASSY SWALE 9	13-10090211	52	Y	4428+43.25	65.81	RT	GS	0.74						70	To Be Removed	
Salado	AC	GRASSY SWALE 10	13-10090211	53	Y	4437+03.34	148.30	RT	GS	1.77	8.92	11.45	2.53	90	3341	70	To Be Removed	
Salado	AC	GRASSY SWALE 11	13-10090211		Y	4436+88.91	63.65	RT	GS	1.46						70	To Be Removed	
Salado	AC	GRASSY SWALE 12	13-10090211	74	Y	4438+42.39	134.47	LT	GS	1.30						70	To Be Removed	
Salado	AC	GRASSY SWALE 13	13-10090211		Y	4438+36.52	63.08	LT	GS	2.85						70	To Be Removed	
Salado	AC	GRASSY SWALE 14	13-10090211		Y	4449+82.75	52.23	RT	GS	1.44						70	To Be Removed	Missing element in SanAntonio_SC.shp
Salado	AE	GRASSY SWALE 16	13-10090211	73	Y	4458+47.34	63.02	LT	GS	1.54	6.91	11.41	4.5	3667	3751	70	To Be Removed	
Salado	AE	GRASSY SWALE 17	13-10090211	71	Y	4460+68.98	63.02	LT	GS	2.21						70	To Be Removed	
Salado	AE	VEG STRIP 17	13-10090211		Y	4466+70.44	44.30	LT	VFS	0.36						85	To Be Removed	
Salado	AE	AQUALOGIC 3	13-10090211		Y	4459+93.05	69.98	RT	AQUA LOGIC	5.31						95	To remain	Missing element in SanAntonio_SC.shp
Salado	AE	VEG STRIP 18	13-10090211		Y	4468+45.06	114.12	RT	VFS	0.48						85	To remain	1
Salado	AE	VEG STRIP 19	13-10090211		Y	4470+69.00	64.94	RT	VFS	0.27						85	To Be Removed	Missing element in SanAntonio_SC.shp
Salado	AG	GRASSY SWALE 22	13-10090211	67	Y	4522+44.88	79.11	LT	GS	1.25	16.34	22.44	6.1	4977	5534	70	To Be Removed	
Salado	AG	VEG STRIP 23	13-10090211		Y	4521+46.73	123.14	LT	VFS	0.26						85	To Be Removed	Missing element in SanAntonio_SC.shp
Salado	AG	VEG STRIP 20	13-10090211		Y	4490+14.99	133.46	LT	VFS	0.77						85	To remain	Missing element in SanAntonio_SC.shp
Salado	AG	GRASSY SWALE 24	13-10090211	66	Y	4527+49.45	72.66	LT	GS	1.43						70	To Be Removed	
Salado	AG	GRASSY SWALE 26	13-10090211		Y	4534+84.18	69.00	LT	GS	2.19						70	To Be Removed	Missing element in SanAntonio_SC.shp
Salado	AG	GRASSY SWALE 19	13-10090211	57	Y	4506+20.59	68.89	RT	GS	2.31						70	To Be Removed	
Salado	AG	GRASSY SWALE 20	13-10090211	58	Y	4513+84.56	168.51	RT	GS	0.68						70	To Be Removed	
Salado	AG	GRASSY SWALE 21	13-10090211	68	Y	4513+96.24	142.96	LT	GS	0.43						70	To Be Removed	
Salado	AG	GRASSY SWALE 23	13-10090211		Y	4523+64.79	82.61	RT	GS	1.59						70	To Be Removed	Missing element in SanAntonio_SC.shp
Salado	AG	GRASSY SWALE 25	13-10090211		Y	4530+78.25	92.94	RT	GS	0.51						70	To Be Removed	Missing element in SanAntonio_SC.shp
Salado	AH	VEG STRIP 24	13-10090211	142	Y	4558+04.37	159.28	RT	VFS	0.94	6.95	7.53	0.58	90	928	85	To Be Removed	
Salado	AH	VEG STRIP 25	13-10090211	143	Y	4570+29.46	156.85	RT	VFS	0.27						85	To Be Removed	

LP 1604 - EXISTING WATER QUALITY BMP INVENTORY AND CALCULATIONS

Major Watershed	Culvert Watershed ID	BMP ID	WPAP Report Number	TxDOT ID	Inside ROW Limits?	Sta	Offset	RT/LT	Type	Contributing Drainage Area (ac)	Total Existing Impervious Cover (ac)	Total Proposed Impervious Cover (ac)	Total Increase in Impervious Cover	Total Load Removal Required (lbs)	Total Load Removal Actual (lbs)	BMP Efficiency (%)		NOTES
CSJ 0253-04-146																		
Salado	AC	GRASSY SWALE 15	13000320;RN109458919		Y	4451+48.84	62.61	RT	GS	1.22	7.68	8.46	0.78	58	2111	70	To Be Removed	Missing element in SanAntonio_SC.shp
Salado	AF	GRASSY SWALE 18	13000320;RN109458919		Y	4477+26.00	130.38	LT	GS	3.80				55		70	To remain	Missing element in SanAntonio_SC.shp
Salado	AG	EXTENDED DET. 1	13000320;RN109458919		Y	4495+35.49	70.12	LT	WQ POND	7.41				629		89	To remain	Missing element in SanAntonio_SC.shp
Salado	AG	VEG STRIP 21	13000320;RN109458919		Y	4494+50.74	57.27	LT	VFS							85	To Be Removed	Missing element in SanAntonio_SC.shp
Salado	AG	VEG STRIP 22	13000320;RN109458919		Y	4498+84.73	2.53	LT	VFS							85	To Be Removed	Missing element in SanAntonio_SC.shp
CSJ 2452-01-064																		
Leon	C	GRASSY SWALE 1	13000836;RN110607827			3798+57.29	85.07	RT	GS	1.48	0	1.48	1.48	1075	1075	70	To remain	Back calculation based on contributing drainage area
CSJ 2452-02-061 (WPAP 00101201A)																		
Salado	S	AQUALOGIC 1	00101201A	43	Y	4244+75.13	204.34	RT	WQ POND	36.41	11.22	22.43	11.21	9151	17200	95	To remain	- Original water quality pond was converted to Aqualogic during construction. - According to the WPAP, 66,745 cf of storage has been provided for treatment. Based on loading calculations, the available storage is able to remove 5384 lbs of TSS. - WPAP states that that the pond was sized to provide treatment for 0.512 inches of storwater runoff.
CSJ 2452-03-070																		
Salado	AG	WQ POND 3		62	NO	4540+89.53	302.81	RT	WQ POND	34.97	11.31	22.61	11.30	9225	17500	89	To remain	No calculation available. 83,500 cf of storage provided. 5.87 ac of impervious cover increase based on water quality storage provided.
Redland/Bulverde (CSJ 2452-03-118)																		
Salado	AH	VEG STRIP 26	13000654;RN104209911		Y	4572+04.44	72.23	RT	VFS	3.72	0	3.72	3.72	2703	2703	85	To Be Removed	Missing element in SanAntonio_SC.shp
Salado	AH	VEG STRIP 27	13000654;RN104209911		Y	4571+49.33	79.98	LT	VFS								To Be Removed	Missing element in SanAntonio_SC.shp
Salado	AH	VEG STRIP 28	13000654;RN104209911		Y	4574+97.34	111.79	LT	VFS								To Be Removed	Missing element in SanAntonio_SC.shp
Salado	AH	VEG STRIP 29	13000654;RN104209911		Y	4568+00.47	152.59	LT	VFS								To Be Removed	Missing element in SanAntonio_SC.shp
Salado	AI	VEG STRIP 30	13000654;RN104209911		Y	4582+99.42	123.97	LT	VFS								To Be Removed	Missing element in SanAntonio_SC.shp
Salado	AI	VEG STRIP 31	13000654;RN104209911		Y	4582+99.42	123.97	LT	VFS								To Be Removed	Missing element in SanAntonio_SC.shp
TOTAL										**172**	**103**	**154**	**51**	**39676**	**66423**			

IH 10- EXISTING WATER QUALITY BMP INVENTORY AND CALCULATIONS

Major Watershed	Culvert Watershed ID	BMP ID	As-built CSJ	WPAP Report Number	TxDOT ID	Inside ROW Limits?	Station	Offset	RT/LT	Type	Contributing Drainage Area (ac)	Existing Impervious Cover (ac)	Proposed Impervious Cover (ac)	Increase in Impervious Cover	Total Load Removal Required (lbs)	Total Load Removal Actual (lbs)	BMP Efficiency (%)	Disturbed/To remain in place	NOTES
CSJ 0072-07-041 (WPAP 13000385)																			
Leon Creek	IH 10 J	VEG STRIP 37	0072-07-041	13000385		Y	594+00.46	70.49	RT	VFS	0.77	0.14	0.64	0.5	404		85	To Remain	Missing element in SanAntonio_SC.shp
Leon Creek	IH 10 I	VEG STRIP 36	0072-07-041	13000385		Y	604+45.94	68.89	LT	VFS	0.9	0.16	0.74	0.58	472		85	To Remain	Missing element in SanAntonio_SC.shp
Leon Creek	IH 10 H	VEG STRIP 35	0072-07-041	13000385		Y	615+72.09	81.83	LT	VFS	3.63	0.62	3.01	2.39	1905	7791	85	To Be Removed	Missing element in SanAntonio_SC.shp
Leon Creek	IH 10 H	VEG STRIP 34	0072-07-041	13000385		Y	630+51.91	61.51	RT	VFS	1.95	0.38	1.57	1.19	1024		85	To Be Removed	Missing element in SanAntonio_SC.shp
Leon Creek	IH 10 G	VEG STRIP 33	0072-07-041	13000385		Y	644+54.08	79.36	RT	VFS	1.58	0.28	1.3	1.02	829		85	To Be Removed	Missing element in SanAntonio_SC.shp
CSJ 0072-08-121 (WPAP 13-08090810)																			
Leon Creek	IH 10 E	VEG STRIP 32	0072-08-121	13-08090810	17	Y	673+90.14	127.08	RT	VFS	1.54	1.45	1.54	0.09	73	77	85	To Be Removed	
TOTAL											**10**	**3**	**9**	**6**	**4708**	**7868**			

EXISTING HAZARDOUS MATERIAL TRAPS								
Major Watershed	**Culvert Watershed ID**	**BMP ID**	**As-built CSJ**	**TxDOT ID**	**Inside ROW Limits?**	**Sta**	**Offset**	**RT/LT**
LP 1604- EXISTING HAZMAT TRAPS								
CSJ 2452-02-023								
Leon	B	HZMT 1	2452-02-023	22	Y	3786+14.87	148.20	LT
Leon	B	HZMT 2	2452-02-023	23	Y	3788+64.57	151.73	RT
Leon	C	HZMT 3	2452-02-023	24	NO	3802+08.98	181.99	RT
Leon	D	HZMT 4	2452-02-023	25	NO	3809+17.46	159.94	RT
Leon	D-02	HZMT 5	2452-02-023	26	NO	3821+77.98	158.24	RT
Leon	D-02	HZMT 6	2452-02-023	21	Y	3851+07.96	156.38	LT
Leon	D-02	HZMT 7	2452-02-023	27	Y	3853+86.45	138.86	RT
Leon	E	HZMT 8	2452-02-023	28	NO	3884+15.16	235.26	RT
Leon	F	HZMT 9	2452-02-023	29	NO	3904+32.65	254.35	RT
CSJ 0072-08-097								
Leon	K	HZMT 10	0072-08-097	19	Y	4054+36.78	1080.29	LT
Leon	K	HZMT 11	0072-08-097	4	Y	4056+44.73	1040.48	RT
CSJ 2452-02-061								
Salado	S	HZMT 12	2452-02-061	86	Y	4250+11.65	96.98	LT
Salado	S	HZMT 13	2452-02-061	44	Y	4250+13.09	77.04	RT
CSJ 2452-03-070								
Salado	AG	HZMT 14	2452-03-070	61	Y	4541+31.75	240.95	RT
IH 10- EXISTING HAZMAT TRAPS								
CSJ 0072-08-097								
Leon Creek		HZMT 22	0072-08-097	8	Y	659+01.90	185.56	LT
Leon Creek		HZMT 21	0072-08-097	15	Y	665+64.97	130.21	RT
Leon Creek		HZMT 20	0072-08-097	6	Y	664+94.38	188.99	LT
Leon Creek		HZMT 19	0072-08-097	16	Y	609+17.57	122.85	RT
Leon Creek		HZMT 18	0072-08-097	7	Y	668+88.88	138.38	LT
Leon Creek		HZMT 17	0072-08-097	18	Y	678+05.21	77.13	RT
Leon Creek		HZMT 16	0072-08-097	5	Y	680+19.70	135.36	LT
Leon Creek		HZMT 15	0072-08-097	20	Y	682+23.46	82.26	RT
CSJ 0072-07-041								
Leon Creek		HZMT 23	0072-07-041	8	Y	640+00	101.8	RT

Major Watershed	Culvert Watershed ID	BMP ID	TxDOT ID	Sta	Offset	RT/LT	Type
Items not found from TxDOT's inventory list							
Salado	W	VEG STRIP XX	Object ID 45	4339+89.80	110.76	RT	VFS
Salado	Z	GRASSY SWALE XX	Object ID 48	4375+56.02	104.02	RT	GS
Salado	AB	GRASSY SWALE XX	Object ID 50	4406+92.67	209.28	RT	GS
Salado	AE	GRASSY SWALE XX	Object ID 55	4467+82.37	195.86	RT	GS
Salado	AG	VEG STRIP XX	Object ID 60	4537+25.34	112.04	RT	VFS
Salado	AG	VEG STRIP XX	Object ID 63	4546+86.00	92.93	LT	VFS
Salado	AG	GRASSY SWALE XX	Object ID 64	4558+24.53	93.98	RT	GS
Salado	AG	GRASSY SWALE XX	Object ID 65	4544+31.26	103.90	LT	GS
Salado	AG	GRASSY SWALE XX	Object ID 69	4514+98.02	143.33	LT	GS
Salado	AG	GRASSY SWALE XX	Object ID 70	4505+85.31	44.97	LT	GS
Salado	AC	GRASSY SWALE XX	Object ID 75	4431+77.71	96.06	LT	GS
Salado	AB	GRASSY SWALE XX	Object ID 77	4412+72.33	111.60	LT	GS
Salado	AB	GRASSY SWALE XX	Object ID 78	4396+37.25	138.51	LT	GS
Salado	Z	GRASSY SWALE XX	Object ID 79	4378+88.23	70.62	LT	GS
Salado	Y	VEG STRIP XX	Object ID 80	4370+85.60	73.90	LT	VFS
Salado	W	GRASSY SWALE XX	Object ID 81	4345+43.54	68.71	LT	GS
Salado	W	GRASSY SWALE XX	Object ID 82	4328+48.90	104.23	LT	GS
Salado	W	GRASSY SWALE XX	Object ID 83	4323+03.77	117.19	LT	GS
Salado	AH	GRASSY SWALE XX	Object ID 144	4573+32.50	132.12	RT	GS
Salado	AH	GRASSY SWALE XX	Object ID 145	4570+94.04	133.19	LT	GS

Items listed above were not found in available as-builts and WPAP's. Removal loads for these items were not included in the calculations and will require additional information to verify load removals.

APPENDIX C

PROPOSED BMP ANALYSIS AND CALCULATIONS

LP 1604- PROPOSED WATER QUALITY BMPS

Crossing ID	Watershed ID	Proposed Drainage Area (ac)	Existing Impervious Cover (ac)	Proposed Impervious Cover (ac)	Impervious Cover Increase (ac)	PROPOSED Required TSS Removal (lbs)	EXISTING Required TSS Removal (lbs)	TOTAL Required TSS Removal (lbs)	Proposed BMP	Credit	Proposed BMP Drainage Area (ac)	Proposed BMP Impervious Cover (ac)	Proposed BMP Pervious Cover (ac)	Pond Proposed Length (ft)	Pond Proposed Width (ft)	Pond Proposed Depth (ft)	Pond Actual Proposed Storage Volume (cf)	Pond Required Storage Volume (cf)	LR Required Pond TSS Removal (lbs)	Proposed Actual TSS Removal (lbs)	Proposed Overtreatment (lbs)
A	Leon Creek	48.83	23.07	29.72	6.65	5,426	0	5,969	PROP GS 1	70	3.59	1.84	1.75							1,357	
									SAND FILTER POND 1	89	33.34	19.18	14.16	98	35	5	17150	17130	17923	6,800	
																				8,157	**2,188**
B	Leon Creek	12.19	4.68	7.1	2.42	1,975	1,075	3,355	SAND FILTER POND 2	89	6.1	3.6	2.5	129	30	5	19350	19329	3362	3,000	
									SAND FILTER POND 3	89	4.09	2.5	1.59	135	30	5	20250	20160	2332	2,200	
																				5,200	**1,845**
C	Leon Creek	17.35	8.71	14.08	5.37	4,382	1,075	5,457	NO TREATMENT PROPOSED												
																				0	**-5,457**
D	Leon Creek	29.36	13.08	21.83	8.75	7,140	0	7,854	PROP VFS 1	85	0.77	0.77	0							679	
									PROP WV 1	85	2.62	2.62	0							2,312	
									PROP WV 2	85	3.45	1.79	1.66							1,602	
									PROP WV 3	85	3.32	3.14	0.18							2,773	
									PROP WV 4	85	1.82	1.66	0.16							1,467	
																				8,833	**979**
D-02	Leon Creek	38.8	18.6	27.8	9.2	7,507	0	8,258	SAND FILTER POND 4	89	10.39	6.06	4.33	152	30	5	22800	22779	5661	4,600	
									SAND FILTER POND 5	89	10.63	6.48	4.15	151	30	5	22650	22639	6046	4,750	
																				9,350	**1,092**
E	Leon Creek	19.87	10.03	14.36	4.33	3,533	0	3,887	SAND FILTER POND 6	89	7.05	5.09	1.96	179	45	4	32220	32134	4731	4,300	
																				4,300	**413**
F	Leon Creek	28.54	12.91	20.3	7.39	6,030	0	6,633	SAND FILTER POND 7	89	3.84	2.17	1.67	130	30	3	11700	11669	2029	1,800	
									PROP WV 5	85	2.94	1.93	1.01							1,717	
									PROP WV 6	85	1.91	1.91	0							1,685	
									PROP WV 7	85	2.81	2.23	0.58							1,976	
																				7,177	**544**
G/H	Leon Creek	33.68	17.36	24.81	7.45	6,079	0	6,687	PROP WV 8	85	2.72	1.99	0.73							1,766	
									PROP WV 9	85	4.28	2.85	1.43							2,534	
									SAND FILTER POND 8	89	5.05	3.94	1.11	130	30	3	11700	11622	3656	2,600	
																				6,900	**213**
I	Leon Creek	21.33	13.28	17.35	4.07	3,321	0	3,653	SAND FILTER POND 9	89	7.34	5.66	1.68	133	25	5	16625	16563	5253	3,743	
																				3,743	**90**
J (CHU 9)	Leon Creek	47.56	25.47	39.64	14.17	11,563	0	12,719	PROP WV 10	85	2.94	2.61	0.33							2,307	
									PROP WV 11	85	3.12	2.32	0.80							2,058	
									PROP WV 12	85	3.35	2.54	0.81							2,252	
									SAND FILTER POND 10	89	14.79	12.56	2.23	218	35	5	38150	38140	11635	8,200	
									SAND FILTER POND 11	89	14.85	11.14	3.71	237	35	5	41475	41456	10345	8,200	
																				23,017	**10,299**
K	Leon Creek	24.84	16.21	22.35	6.14	5,010	0	5,511	PROP WV 13	85	3.3	3.13	0.17							2,764	
									PROP WV 14	85	3.15	3.09	0.06							2,727	
																				5,491	**-20**
L	Leon Creek	71	61.43	76.73	15.3	12,485	375	14,146	SAND FILTER POND 12	89	16.8	15.65	1.15	153	35	5	26775	26633	14474	7,350	
									SAND FILTER POND 13	89	17.14	16.46	0.68	151	35	5	26425	26335	15216	7,400	
																				14,750	**604**
M	Upper SA Creek	22.69	17.4	25.89	8.49	6,928	0	7,621	PROP WV 15	85	3.5	3.35	0.15							2,958	
									PROP WV 16	85	3.48	3.34	0.14							2,949	
																				5,907	**-1,714**
N	Upper SA Creek	17.42	11.55	15.76	4.21	3,435	0	3,779	PROP WV 17	85	2.89	2.62	0.27							2,315	
									PROP WV 18	85	2.61	2.42	0.19							2,138	
																				4,453	**674**
O	Upper SA Creek	30.76	17.2	23.61	6.41	5,231	302	6,086	SAND FILTER POND 14	89	5.03	3.77	1.26	73	30	5	10950	10841	3501	2,500	
									SAND FILTER POND 15	89	7	5.38	1.62	76	30	5	11400	11314	4994	3,000	
									SAND FILTER POND 16	89	3.42	2.61	0.81	76	30	5	11400	11324	2423	2,000	
																				7,500	**1,414**
P/Q/R	Upper SA Creek	5.07	3.91	4.41	0.5	408	0	449	PROP WV 19	85	2.74	2.54	0.2							2,244	
																				2,244	**1,795**

LP 1604- PROPOSED WATER QUALITY BMPS

Crossing ID	Watershed ID	Proposed Drainage Area (ac)	Existing Impervious Cover (ac)	Proposed Impervious Cover (ac)	Impervious Cover Increase (ac)	PROPOSED Required TSS Removal (lbs)	EXISTING Required TSS Removal (lbs)	TOTAL Required TSS Removal (lbs)	Proposed BMP	Credit	Proposed BMP Drainage Area (ac)	Proposed BMP Impervious Cover (ac)	Proposed BMP Pervious Cover (ac)	Proposed Length (ft)	Pond Proposed Width (ft)	Pond Proposed Depth (ft)	Pond Actual Proposed Storage Volume (cf)	Pond Required Storage Volume (cf)	LR Pond TSS Removal (lbs)	Proposed Actual TSS Removal (lbs)	Proposed Overtreatment (lbs)
S/T	Salado Creek	66.04	34.59	48.92	14.33	11,693	11,024	24,989	Exist Aqualogic 1	90	36.41	30.79	5.62							18,600	
									SAND FILTER POND 17	89	10.67	8.59	2.08	154	35	5	26950	26836	7966	5,700	
									SAND FILTER POND 18	89	3.3	1.67	1.63	131	35	5	22925	22824	1566	1,566	
									TOTAL											25,866	877
U	Salado Creek	30	13	17.88	4.88	3,982	1,994	6,574	PROP VFS 2	85	1.09	1.09	0							962	
									EX VFS 9	85	0.19	0.19	0							168	
									EX GS 3	70	1.21	0.68	0.53							500	
									PROP WV 20	85	1.73	1.73	0							1,526	
									SAND FILTER POND 19	89	9.7	6.08	3.62	108	35	5	18900	18757	5669	4,250	
									TOTAL											7,406	832
V/W/X	Salado Creek	45.34	21.66	34.87	12.91	10,535	1,153	12,857	PROP WV 21	85	2.97	2.97	0							2,620	
									PROP WV 22	85	2.92	2.92	0							2,576	
									PROP VFS 4	85	1.7	1.7	0							1,500	
									PROP VFS 5	85	0.58	0.58	0							512	
									PROP VFS 6	85	0.96	0.96	0							847	
									EX VFS 11	85	0.54	0.54	0							476	
									EX VFS 10	85	0.43	0.43	0							379	
									SAND FILTER POND 20	89	7.7	5.72	1.98	84	30	5	12600	12559	5313	3,300	
									TOTAL											**12,211**	**-646**
Y	Salado Creek	24.46	15.26	22.11	6.85	5,590	756	6,980	PROP WV 23	85	3.03	2.7	0.33							2,387	
									PROP WV 24	85	3.19	2.87	0.32							2,537	
									PROP WV 25	85	2.83	2.03	0.8							1,802	
									TOTAL											**6,725**	**-255**
Z	Salado Creek	12.91	9	11.77	2.77	2,260	41	2,531	PROP WV 26	85	2.2	1.9	0.3							1,681	
									TOTAL											**1,681**	**-851**
AA	Salado Creek	5.76	3.49	3.94	0.45	367	175	596	PROP VFS 6	85	0.8	0.8	0							706	
									TOTAL											**706**	**109**
AB	Salado Creek	28.95	20.67	23.41	2.74	2,236	1,934	4,587	PROP WV 27	85	2.7	2.04	0.66							1,809	
									PROP WV 28	85	4.03	2.6	1.43							2,314	
									PROP WV 29	85	2.02	2.02	0							1,782	
									TOTAL											**5,905**	**1,318**
AC	Salado Creek	21.3	12.81	14.96	2.15	1,754	148	2,093	SAND FILTER POND 21	89	4.3	2.94	1.36	146	25	5	18250	18166	2736	2,500	
									TOTAL											**2,500**	**407**
AE	Salado Creek	18.03	15.2	15.78	0.58	473	3,667	4,554	EX VFS 18	85	0.41	0.41	0							363	
									PROP WV 30	85	0.88	0.88	0							776	
									PROP WV 31	85	0.99	0.99	0							873	
									Exist Aqualogic 1	90	5.17	4.64	0.53							1,996	
									TOTAL											**4,009**	**-545**
AF	Salado Creek	14.24	11.08	11.65	0.57	465	55	572	EX GS 18	70	2.17	1.37	0.8							1,005	
									TOTAL											**1,005**	**432**
AG	Salado Creek	63.01	40.67	46.8	6.13	5,002	14,831	21,816	EX VFS 20	85	0.72	0.72	0							635	
									PROP WV 32	85	2.92	2	0.92							1,777	
									Exist Extended Detention 1	90	6.83	6.11	0.72							488	
									Exist Sedimentation Pond 3	89	34.97	26.96	8.01							18,800	
									TOTAL											**21,701**	**-116**
AH	Salado Creek	25.82	11.76	18.89	7.13	5,818	1,442	7,986	SAND FILTER POND 22	89	4.18	2.73	1.45	177	35	5	30975	30826	2543	2,500	
									PROP WV 33	85	2.81	2.11	0.7							1,871	
									SAND FILTER POND 23	89	7.39	5.63	1.76	175	35	5	30625	30500	5226	4,600	
									TOTAL											**8,971**	**986**
AI	Salado Creek	33.62	17.46	25.75	8.29	6,765	1,352	8,928	PROP WV 34	85	2.95	2.14	0.81							1,899	
									PROP WV 35	85	2.95	2.73	0.22							2,412	
									PROP WV 36	85	1.9	1.9	0							1,676	
									PROP WV 37	85	2.91	2.1	0.81							1,864	
									PROP WV 38	85	2.94	2.27	0.67							2,012	
									TOTAL											**9,863**	**936**
AJ	Salado Creek	1.00	0.45	0.55	0.1	82	0	90	NO TREATMENT PROPOSED												
									TOTAL											**0**	**-90**

LP 1604- PROPOSED WATER QUALITY BMPS

Crossing ID	Watershed ID	Proposed Drainage Area (ac)	Existing Impervious Cover (ac)	Proposed Impervious Cover (ac)	Impervious Cover Increase (ac)	PROPOSED Required TSS Removal (lbs)	EXISTING Required TSS Removal (lbs)	TOTAL Required TSS Removal (lbs)	Proposed BMP	Credit	Proposed BMP Drainage Area (ac)	Proposed BMP Impervious Cover (ac)	Proposed BMP Pervious Cover (ac)	Proposed Length (ft)	Pond Proposed Width (ft)	Pond Proposed Depth (ft)	Pond Actual Proposed Storage Volume (cf)	Pond Required Storage Volume (cf)	LR Pond TSS Removal (lbs)	Proposed Actual TSS Removal (lbs)	Proposed Overtreatment (lbs)
AK	Salado Creek	12.29	7.59	10.03	2.44	1,991	0	**2,190**	PROP WV 39	85	2.91	2.54	0.37							2,246	
									TOTAL											**2,246**	**56**
AL/AM/AN/AO-01	Salado Creek	45.15	25.44	33.89	8.45	6,895	0	**7,585**	PROP WV 40	85	3.27	2.25	1.02							1,999	
									PROP WV 41	85	3.25	2.3	0.95							2,042	
									PROP WV 42	85	3.07	1.88	1.19							1,675	
									PROP WV 43	85	2.77	1.99	0.78							1,767	
									PROP WV 44	85	1.97	1.5	0.47							1,330	
									TOTAL											**8,813**	**1,228**
AO-02/AO-03	Salado Creek	32.29	16.04	24.64	8.6	7,018	0	**7,719**	SAND FILTER POND 24	89	9.65	8.05	1.6	121	30	5	18150	18035	7460	4,500	
									SAND FILTER POND 25	89	7.78	6.65	1.13	126	30	4	15120	15067	6160	3,700	
									TOTAL											**8,200**	**481**
AO-04	Salado Creek	13.2	7.47	9.79	2.32	1,893	0	**2,082**	PROP WV 45	85	2.91	2.01	0.9							1,786	
									TOTAL											**1,786**	**-297**
AO-05	Salado Creek	13.46	6.16	9.84	3.68	3,003	0	**3,303**	SAND FILTER POND 26	89	6.18	4.37	1.81	75	25	5	9375	9371	4063	2,520	
									TOTAL											**2,520**	**-783**
AO-06	Salado Creek	18.24	8.46	12.84	4.38	3,574	0	**3,931**	SAND FILTER POND 27	89	8.04	5.2	2.84	133	25	5	16625	16613	4845	3,700	
									TOTAL											**3,700**	**-231**
AO-07	Salado Creek	16.25	9.6	12.9	3.3	2,693	0	**2,962**	PROP WV 46	85	2.5	2.06	0.44							1,824	
									PROP WV 47	85	2.5	2.13	0.37							1,884	
									TOTAL											**3,708**	**746**
TOTAL		**1,011**	**583**	**797**	**214**	**174,543**	**41,398**	**236,989**	**TOTAL**											**256,544**	**19,554**

IH 10- PROPOSED WATER QUALITY BMPS

Crossing ID	Watershed ID	Proposed Drainage Area (ac)	Existing Impervious Cover (ac)	Proposed Impervious Cover (ac)	Impervious Cover Increase (ac)	Proposed Required TSS Removal (lbs)	Existing Required TSS Removal (lbs)	Total Required TSS Removal (lbs)	Proposed BMP	Credit	Proposed BMP Drainage Area (ac)	Proposed BMP Impervious Cover (ac)	Proposed BMP Pervious Cover (ac)	Pond Proposed Length (ft)	Pond Proposed Width (ft)	Pond Proposed Depth (ft)	Pond Actual Proposed Storage Volume (cf)	Pond Required Storage Volume (cf)	LR Required Pond TSS Removal (lbs)	Proposed Actual TSS Removal (lbs)	Proposed Overtreatment (lbs)
IH 10 B	Leon Creek	35.53	22.88	24.89	2.01	1,640		1,804	PROP WV 48	85	2.65	2	0.65							1,774	1,824
									PROP GS 2	70	3.35	2.54	0.81							1,855	
									TOTAL											**3,628**	
IH 10 C	Leon Creek	12.32	7.78	9.96	2.18	1,779		1,957	SAND FILTER POND 28	89	3.83	3.25	0.58	102	30	5	15300	15262	3011	2,500	543
									TOTAL											**2,500**	
IH 10 D	Leon Creek	21.58	12.34	17.19	4.85	3,958		4,353	PROP WV 49	85	3.03	2.26	0.77							2,005	21
									PROP WV 50	85	3.7	2.67	1.03							2,370	
									TOTAL											**4,375**	
IH 10 E	Leon Creek	19.49	12.8	14.29	1.49	1,216	73	1,418	*MAJORITY OF AREA IS IN FLOODPLAIN. NO TREATMENT PROVIDED.*												-1,418
									TOTAL											**0**	
IH 10 F	Leon Creek	22.82	15.46	17.49	2.03	1,656		1,822	PROP WV 51	85	4.25	3.19	1.06							2,829	1,007
									TOTAL											**2,829**	
IH 10 G	Leon Creek	5.74	4.24	4.45	0.21	171	829	1,101	PROP WV 52	85	2.2	1.57	0.63							1,394	293
									TOTAL											**1,394**	
IH 10 H	Leon Creek	24.04	9.96	14.72	4.76	3,884	2,929	7,494	PROP VFS 7	85	0.55	0.55	0							485	-3,083
									PROP GS 3	70	2.79	1.55	1.24							1,140	
									PROP GS 4	70	2.49	1.64	0.85							1,201	
									PROP GS 5	70	3.52	2.16	1.36							1,585	
									TOTAL											**4,412**	
IH 10 I	Leon Creek	10.62	5.4	7.82	2.42	1,975	472	2,692	PROP GS 6	70	1.23	0.9	0.33							658	781
									PROP GS 7	70	2.33	1.95	0.38							1,421	
									PROP WV 53	85	2.23	1.57	0.66							1,394	
									TOTAL											**3,473**	
IH 10 J	Leon Creek	6.53	3.69	4.65	0.96	783	404	1,306	EX VFS 37	70	0.64	0.64	0							465	-841
									TOTAL											**465**	
IH 10 K	Leon Creek	10.93	6.67	8.04	1.37	1,118		1,230	PROP GS 8	70	3.92	2.76	1.16							2,019	2,196
									PROP GS 9	70	3.02	1.92	1.1							1,408	
									TOTAL											**3,426**	
TOTAL		**213**	**132**	**153**	**21**	**17,201**	**4,708**	**25,177**	**TOTAL**											**26,502**	**1,325**

SUMMARY OF BMP ANALYSIS

Roadway	Proposed Drainage Area (ac)	Existing Impervious Cover (ac)	Proposed Impervious Cover (ac)	Impervious Cover Increase (ac)	PROPOSED Required TSS Removal (lbs)	EXISTING Required TSS Removal (lbs)	TOTAL Required TSS Removal (lbs)	Proposed Actual TSS Removal (lbs)	Proposed Overtreatment (lbs)
IH 10	213	132	153	21	17,201	4,708	25,177	26,502	1,325
LP 1604	1,011	583	797	214	174,543	43,776	239,516	256,544	17,028
TOTAL	**1,224**	**715**	**950**	**235**	**191,744**	**48,484**	**264,693**	**283,046**	**18,353**

Texas Commission on Environmental Quality

TSS Removal Calculations 04-20-2009

Project Name: LP 1604
Date Prepared: 5/16/2019

1. The Required Load Reduction for the total project: Calculations from RG-348 Pages 3-27 to 3-30

Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$

where:

$L_{M\ TOTAL\ PROJECT}$ = Required TSS removal resulting from the proposed development = 80% of increased load
A_N = Net increase in impervious area for the project
P = Average annual precipitation, inches

Site Data: Determine Required Load Removal Based on the Entire Project

County =	Bexar	
Total project area included in plan * =	36.41	acres
Predevelopment impervious area within the limits of the plan * =	11.22	acres
Total post-development impervious area within the limits of the plan* =	22.43	acres
Total post-development impervious cover fraction * =	46.87	
P =	30	inches
$L_{M\ TOTAL\ PROJECT}$ =	9151	lbs.

* The values entered in these fields should be for the total project area.

Number of drainage basins / outfalls areas leaving the plan area = 1

2. Drainage Basin Parameters (This information should be provided for each basin):

Drainage Basin/Outfall Area No. = WQ Pond # S EXISTING CONDITIONS

Total drainage basin/outfall area =	36.41	acres	<<MEASURED FROM SURVEY
Predevelopment impervious area within drainage basin/outfall area =	11.22	acres	<<ASSUME 50% IC INCREASE ****
Post-development impervious area within drainage basin/outfall area =	22.43	acres	<<MEASURED FROM SURVEY
Post-development impervious fraction within drainage basin/outfall area =	0.62		
$L_{M\ THIS\ BASIN}$ =	9151	lbs.	<<existing REQUIRED removal WITH ASSUMPTIONS ****

3. Indicate the proposed BMP Code for this basin.

Proposed BMP = Aqualogic Cartridge Filter
Removal efficiency = 95 percent

4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.

RG-348 Page 3-33 Equation 3.7: L_R = (BMP efficiency) x P x (A_I x 34.6 + A_P x 0.54)

where:

A_C = Total On-Site drainage area in the BMP catchment area
A_I = Impervious area proposed in the BMP catchment area
A_P = Pervious area remaining in the BMP catchment area
L_R = TSS Load removed from this catchment area by the proposed BMP

A_C =	36.41	acres
A_I =	22.43	acres
A_P =	13.98	acres
L_R =	22333	lbs

5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area

Desired $L_{M\ THIS\ BASIN}$ = 17200 lbs. << existing ACTUAL removal for the storage provided

F = 0.77

6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area. Calculations from RG-348 Pages 3-34 to 3-36

Rainfall Depth =	0.97	inches
Post Development Runoff Coefficient =	0.43	
On-site Water Quality Volume =	55527	cubic feet

Calculations from RG-348 Pages 3-36 to 3-37

Off-site area draining to BMP =	0.00	acres
Off-site Impervious cover draining to BMP =	0.00	acres
Impervious fraction of off-site area =	0	
Off-site Runoff Coefficient =	0.00	
Off-site Water Quality Volume =	0	cubic feet
Storage for Sediment =	11105	
Total Capture Volume (required water quality volume(s) x 1.20) =	66632	cubic feet

<<available storage in existing pond approximately 66,745 CF

13. AquaLogic™ Cartridge System Designed as Required in RG-348 Pages 3-74 to 3-78

** 2005 Technical Guidance Manual (RG-348) does not exempt the required 20% increase with maintenance contract with AquaLogic™.

Required Sedimentation chamber capacity =	66632	cubic feet
Filter canisters (FCs) to treat WQV =	153.33	cartridges
Filter basin area (RIA_F) =	306.67	square feet

Texas Commission on Environmental Quality

TSS Removal Calculations 04-20-2009

Project Name: LP 1604
Date Prepared: 5/16/2019

1. The Required Load Reduction for the total project: Calculations from RG-348 Pages 3-27 to 3-30

Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$

where:
$L_{M\ TOTAL\ PROJECT}$ = Required TSS removal resulting from the proposed development = 80% of increased load
A_N = Net increase in impervious area for the project
P = Average annual precipitation, inches

Site Data: Determine Required Load Removal Based on the Entire Project

County =	Bexar	
Total project area included in plan * =	36.41	acres
Predevelopment impervious area within the limits of the plan * =	11.22	acres
Total post-development impervious area within the limits of the plan* =	30.79	acres
Total post-development impervious cover fraction * =	46.87	
P =	30	inches
$L_{M\ TOTAL\ PROJECT}$ =	15969	lbs.

* The values entered in these fields should be for the total project area.

Number of drainage basins / outfalls areas leaving the plan area = 1

2. Drainage Basin Parameters (This information should be provided for each basin):

Drainage Basin/Outfall Area No. = WQ Pond # S PROPOSED CONDITIONS

Total drainage basin/outfall area =	36.41	acres	<<MEASURED FROM PROPOSED DRAINAGE AREA
Predevelopment impervious area within drainage basin/outfall area =	11.22	acres	<<ASSUME 50% IC INCREASE FROM EXISTING (SEE EXISTING) ****
Post-development impervious area within drainage basin/outfall area =	30.79	acres	<<MEASURED FROM PROPOSED ROADWAY
Post-development impervious fraction within drainage basin/outfall area =	0.85		
$L_{M\ THIS\ BASIN}$ =	15969	lbs.	<<proposed REQUIRED removal WITH ASSUMPTIONS ****

3. Indicate the proposed BMP Code for this basin.

Proposed BMP = Aqualogic Cartridge Filter
Removal efficiency = 95 percent

4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.

RG-348 Page 3-33 Equation 3.7: L_R = (BMP efficiency) x P x (A_I x 34.6 + A_P x 0.54)

where:
A_C = Total On-Site drainage area in the BMP catchment area
A_I = Impervious area proposed in the BMP catchment area
A_P = Pervious area remaining in the BMP catchment area
L_R = TSS Load removed from this catchment area by the proposed BMP

A_C =	36.41	acres
A_I =	30.79	acres
A_P =	5.62	acres
L_R =	30449	lbs

5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area

Desired $L_{M\ THIS\ BASIN}$ = 18600 lbs. << proposed ACTUAL removal for the storage provided

F = 0.61

6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area. Calculations from RG-348 Pages 3-34 to 3-36

Rainfall Depth =	0.60	inches
Post Development Runoff Coefficient =	0.69	
On-site Water Quality Volume =	54584	cubic feet

Calculations from RG-348 Pages 3-36 to 3-37

Off-site area draining to BMP =	0.00	acres
Off-site Impervious cover draining to BMP =	0.00	acres
Impervious fraction of off-site area =	0	
Off-site Runoff Coefficient =	0.00	
Off-site Water Quality Volume =	0	cubic feet
Storage for Sediment =	10917	
Total Capture Volume (required water quality volume(s) x 1.20) =	65501	cubic feet

<<available storage in existing pond approximately 66,745 CF

13. AquaLogic™ Cartridge System Designed as Required in RG-348 Pages 3-74 to 3-78

** 2005 Technical Guidance Manual (RG-348) does not exempt the required 20% increase with maintenance contract with AquaLogic™.

Required Sedimentation chamber capacity =	65501	cubic feet
Filter canisters (FCs) to treat WQV =	150.73	cartridges
Filter basin area (RIA_F) =	301.46	square feet

Texas Commission on Environmental Quality

TSS Removal Calculations 04-20-2009

Project Name: LP 1604
Date Prepared: 5/16/2019

1. The Required Load Reduction for the total project: Calculations from RG-348 Pages 3-27 to 3-30

Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$

where:

$L_{M\ TOTAL\ PROJECT}$ = Required TSS removal resulting from the proposed development = 80% of increased load
A_N = Net increase in impervious area for the project
P = Average annual precipitation, inches

Site Data: Determine Required Load Removal Based on the Entire Project

County =	Bexar	
Total project area included in plan * =	34.97	acres
Predevelopment impervious area within the limits of the plan * =	11.31	acres
Total post-development impervious area within the limits of the plan* =	22.61	acres
Total post-development impervious cover fraction * =	46.87	
P =	30	inches
$L_{M\ TOTAL\ PROJECT}$ =	9225	lbs.

* The values entered in these fields should be for the total project area.

Number of drainage basins / outfalls areas leaving the plan area = 1

2. Drainage Basin Parameters (This information should be provided for each basin):

Drainage Basin/Outfall Area No. = WQ Pond # AG EXISTING CONDITIONS

Total drainage basin/outfall area =	34.97	acres	<<MEASURED FROM SURVEY
Predevelopment impervious area within drainage basin/outfall area =	11.31	acres	<<ASSUME 50% IC INCREASE ****
Post-development impervious area within drainage basin/outfall area =	22.61	acres	<<MEASURED FROM SURVEY
Post-development impervious fraction within drainage basin/outfall area =	0.65		
$L_{M\ THIS\ BASIN}$ =	9225	lbs.	<<existing REQUIRED removal WITH ASSUMPTIONS ****

3. Indicate the proposed BMP Code for this basin.

Proposed BMP = Sand Filter
Removal efficiency = 89 percent

4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.

RG-348 Page 3-33 Equation 3.7: $L_R = (\text{BMP efficiency}) \times P \times (A_I \times 34.6 + A_P \times 0.54)$

where:

A_C = Total On-Site drainage area in the BMP catchment area
A_I = Impervious area proposed in the BMP catchment area
A_P = Pervious area remaining in the BMP catchment area
L_R = TSS Load removed from this catchment area by the proposed BMP

A_C =	34.97	acres
A_I =	22.61	acres
A_P =	12.36	acres
L_R =	21066	lbs

5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area

Desired $L_{M\ THIS\ BASIN}$ = 17500 lbs. << existing ACTUAL removal for the storage provided

F = 0.83

6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area. Calculations from RG-348 Pages 3-34 to 3-36

Rainfall Depth =	1.20	inches
Post Development Runoff Coefficient =	0.46	
On-site Water Quality Volume =	69557	cubic feet

Calculations from RG-348 Pages 3-36 to 3-37

Off-site area draining to BMP =	0.00	acres
Off-site Impervious cover draining to BMP =	0.00	acres
Impervious fraction of off-site area =	0	
Off-site Runoff Coefficient =	0.00	
Off-site Water Quality Volume =	0	cubic feet
Storage for Sediment =	13911	
Total Capture Volume (required water quality volume(s) x 1.20) =	83468	cubic feet

<<available storage in existing pond approximately 83,500 CF

Texas Commission on Environmental Quality

TSS Removal Calculations 04-20-2009

Project Name: LP 1604
Date Prepared: 5/16/2019

1. The Required Load Reduction for the total project: Calculations from RG-348 Pages 3-27 to 3-30

Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$

where:

$L_{M\ TOTAL\ PROJECT}$ = Required TSS removal resulting from the proposed development = 80% of increased load
A_N = Net increase in impervious area for the project
P = Average annual precipitation, inches

Site Data: Determine Required Load Removal Based on the Entire Project

County =	Bexar	
Total project area included in plan * =	34.97	acres
Predevelopment impervious area within the limits of the plan * =	11.31	acres
Total post-development impervious area within the limits of the plan* =	26.96	acres
Total post-development impervious cover fraction * =	46.87	
P =	30	inches
$L_{M\ TOTAL\ PROJECT}$ =	12770	lbs.

* The values entered in these fields should be for the total project area.

Number of drainage basins / outfalls areas leaving the plan area = 1

2. Drainage Basin Parameters (This information should be provided for each basin):

Drainage Basin/Outfall Area No. = WQ Pond # AG PROPOSED CONDITIONS

Total drainage basin/outfall area =	34.97	acres	<<MEASURED FROM SURVEY
Predevelopment impervious area within drainage basin/outfall area =	11.31	acres	<<ASSUME 50% IC INCREASE FROM EXISTING (SEE EXISTING) ****
Post-development impervious area within drainage basin/outfall area =	26.96	acres	<<MEASURED FROM SURVEY
Post-development impervious fraction within drainage basin/outfall area =	0.77		
$L_{M\ THIS\ BASIN}$ =	12770	lbs.	<<existing REQUIRED removal WITH ASSUMPTIONS ****

3. Indicate the proposed BMP Code for this basin.

Proposed BMP = Sand Filter
Removal efficiency = 89 percent

4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.

RG-348 Page 3-33 Equation 3.7: $L_R = (\text{BMP efficiency}) \times P \times (A_I \times 34.6 + A_P \times 0.54)$

where:

A_C = Total On-Site drainage area in the BMP catchment area
A_I = Impervious area proposed in the BMP catchment area
A_P = Pervious area remaining in the BMP catchment area
L_R = TSS Load removed from this catchment area by the proposed BMP

A_C =	34.97	acres
A_I =	26.96	acres
A_P =	8.01	acres
L_R =	25022	lbs

5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area

Desired $L_{M\ THIS\ BASIN}$ = 18800 lbs. << existing ACTUAL removal for the storage provided

F = 0.75

6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area. Calculations from RG-348 Pages 3-34 to 3-36

Rainfall Depth = 0.92 inches
Post Development Runoff Coefficient = 0.59
On-site Water Quality Volume = 68082 cubic feet

Calculations from RG-348 Pages 3-36 to 3-37

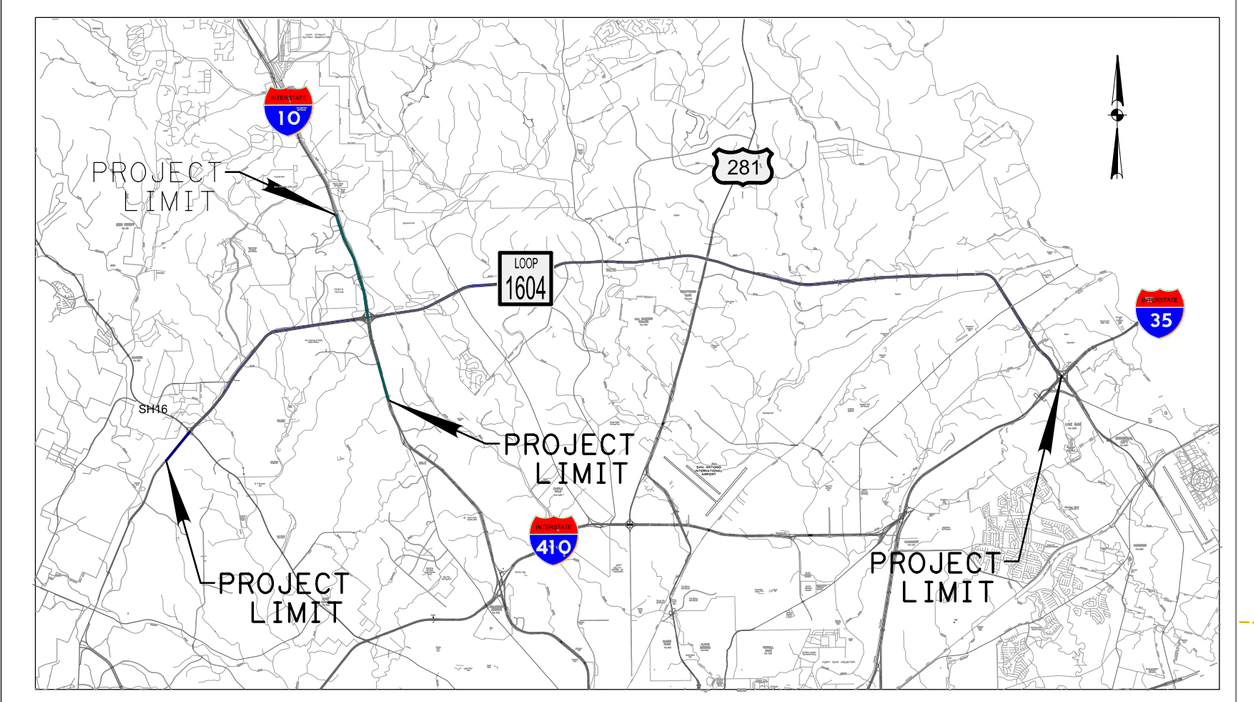
Off-site area draining to BMP =	0.00	acres
Off-site Impervious cover draining to BMP =	0.00	acres
Impervious fraction of off-site area =	0	
Off-site Runoff Coefficient =	0.00	
Off-site Water Quality Volume =	0	cubic feet
Storage for Sediment =	13616	
Total Capture Volume (required water quality volume(s) x 1.20) =	81699	cubic feet

<<available storage in existing pond approximately 83,500 CF

APPENDIX D

EXHIBIT B: PROPOSED WATER QUALITY BMP LOCATIONS

PROJECT LOCATION MAP



PART 1 OF 1

CONTROL: 2452 SECTION: 02 JOB: 083

TEXAS DEPARTMENT OF TRANSPORTATION

CONCEPTUAL SCHEMATIC LAYOUT

LOOP 1604

BEXAR COUNTY

IH 10:

LIMITS: FROM CAMP BULLIS ROAD TO UTSA BLVD
LENGTH: 4.4 MILES
FUNCTIONAL CLASS: INTERSTATE

LOOP 1604:

LIMITS: FROM SH 16 TO I-35
LENGTH: 22 MILES
DESIGN SPEED: 60 MPH
FUNCTIONAL CLASS: PRINCIPAL ARTERIAL

OFFICE OF THE DISTRICT ENGINEER

SAN ANTONIO, TEXAS

LEGEND

- DIRECTION OF FLOW
- OR PROP MANHOLE
- PROP STORM SEWER
- EXIST STORM SEWER
- OPEN DITCH
- VFS VEGETATIVE FILTER STRIP
- GS GRASSY SWALE

COLOR LEGEND

- EXISTING WIDENING MAIN LANES
- PROPOSED WIDENING MAIN LANES, CD ROADS, & RAMPS
- PROPOSED DIRECT CONNECTOR
- PROPOSED FRONTAGE ROAD
- PROPOSED BRIDGE
- PROPOSED SIDEWALK
- CRITICAL FEATURES
- EXISTING HAZMAT TRAP TO REMAIN
- EXISTING HAZMAT TRAP TO BE REMOVED
- EXISTING GRASSY SWALE TO REMAIN
- EXISTING GRASSY SWALE TO BE REMOVED
- PROPOSED GRASSY SWALE
- EXISTING VFS TO REMAIN
- EXISTING VFS TO BE REMOVED
- PROPOSED VFS
- EXISTING POND TO REMAIN
- PROPOSED SAND FILTER POND
- PROPOSED WET VAULT
- 100-YR FEMA FLOODPLAIN
- EXISTING GRASSY SWALE DRAINAGE AREA
- PROPOSED GRASSY SWALE AREA
- EXISTING VFS DRAINAGE AREA
- PROPOSED VFS DRAINAGE AREA
- EXISTING POND TO REMAIN DRAINAGE AREA
- PROPOSED SAND FILTER POND AREA
- PROPOSED WET VAULT DRAINAGE AREA
- PROPOSED OUTFALL DRAINAGE BOUNDARY

PRELIMINARY
DOCUMENT IS FOR INTERIM REVIEW AND NOT INTENDED FOR CONSTRUCTION BIDDING, OR PERMIT PURPOSES.
ENGINEER: DAISY ESQUIVEL, PE
P.E. SERIAL No.: 102031
DATE: 5/27/2020

AECOM
Texas Department of Transportation
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EXHIBIT B: PROPOSED WATER WATER QUALITY BMPS

LOOP 1604

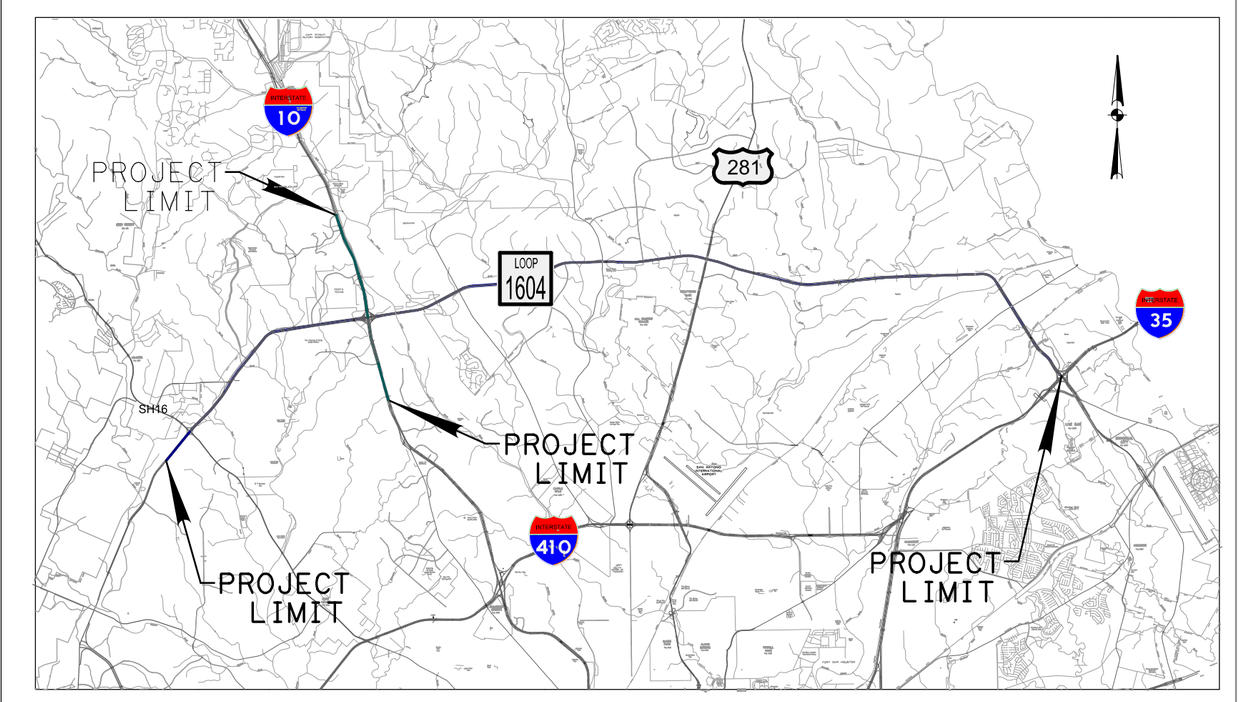
SCALE: 1" = 200 FT HOR

1 / 4

FILE NAME:

SCALE: 1" = 200'

PROJECT LOCATION MAP



PART 1 OF 1

CONTROL: 2452 SECTION: 02 JOB: 083

TEXAS DEPARTMENT OF TRANSPORTATION

CONCEPTUAL SCHEMATIC LAYOUT

LOOP 1604

BEXAR COUNTY

IH 10:

LIMITS: FROM CAMP BULLIS ROAD TO UTSA BLVD
LENGTH: 4.4 MILES
FUNCTIONAL CLASS: INTERSTATE

LOOP 1604:

LIMITS: FROM SH 16 TO I-35
LENGTH: 22 MILES
DESIGN SPEED: 60 MPH
FUNCTIONAL CLASS: PRINCIPAL ARTERIAL

OFFICE OF THE DISTRICT ENGINEER

SAN ANTONIO, TEXAS

LEGEND

- DIRECTION OF FLOW
- OR PROP MANHOLE
- PROP STORM SEWER
- EXIST STORM SEWER
- OPEN DITCH
- VFS VEGETATIVE FILTER STRIP
- GS GRASSY SWALE

COLOR LEGEND

- EXISTING WIDENING MAIN LANES
- PROPOSED WIDENING MAIN LANES, CD ROADS, & RAMPS
- PROPOSED DIRECT CONNECTOR
- PROPOSED FRONTAGE ROAD
- PROPOSED BRIDGE
- PROPOSED SIDEWALK
- CRITICAL FEATURES
- EXISTING HAZMAT TRAP TO REMAIN
- EXISTING HAZMAT TRAP TO BE REMOVED
- EXISTING GRASSY SWALE TO REMAIN
- EXISTING GRASSY SWALE TO BE REMOVED
- PROPOSED GRASSY SWALE
- EXISTING VFS TO REMAIN
- EXISTING VFS TO BE REMOVED
- PROPOSED VFS
- EXISTING POND TO REMAIN
- PROPOSED SAND FILTER POND
- PROPOSED WET VAULT
- 100-YR FEMA FLOODPLAIN
- EXISTING GRASSY SWALE DRAINAGE AREA
- PROPOSED GRASSY SWALE AREA
- EXISTING VFS DRAINAGE AREA
- PROPOSED VFS DRAINAGE AREA
- EXISTING POND TO REMAIN DRAINAGE AREA
- PROPOSED SAND FILTER POND AREA
- PROPOSED WET VAULT DRAINAGE AREA
- PROPOSED OUTFALL DRAINAGE BOUNDARY

PRELIMINARY
DOCUMENT IS FOR INTERIM REVIEW AND NOT INTENDED FOR CONSTRUCTION BIDDING, OR PERMIT PURPOSES.
ENGINEER: DAISY ESQUIVEL
P.E. SERIAL No.: 102031
DATE: 5/29/2020

AECOM

Texas Department of Transportation © 2019 TxDOT

EXHIBIT B: PROPOSED WATER WATER QUALITY BMPS

LOOP 1604

SCALE: 1" = 200 FT HOR

2 / 4

FILE NAME:

PRELIMINARY SUBJECT TO CHANGE

PRELIMINARY SUBJECT TO CHANGE

PRELIMINARY SUBJECT TO CHANGE

SCALE: 1" = 200'

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PROJECT LOCATION MAP

PART 1 OF 1
CONTROL: 2412 SECTION: 02 JOB: 082

TEXAS DEPARTMENT OF TRANSPORTATION

CONCEPTUAL SCHEMATIC LAYOUT
LOOP 1604
BEXAR COUNTY

IH 10:
LIMITS FROM CAMP BULLIS ROAD TO UTSA BLVD
LENGTH: 44 MILES
FUNCTIONAL CLASS: INTERSTATE

LOOP 1604:
LIMITS FROM IH 10 TO I-35
LENGTH: 28 MILES
DESIGN SPEED: 60 MPH
FUNCTIONAL CLASS: PRINCIPAL ARTERIAL

OFFICE OF THE DISTRICT ENGINEER
SAN ANTONIO, TEXAS

LEGEND

- DIRECTION OF FLOW
- PROP MANHOLE
- PROP STORM SEWER
- EXIST STORM SEWER
- OPEN DITCH
- VFS VEGETATIVE FILTER STRIP
- GS GRASSY SWALE

COLOR LEGEND

- EXISTING MIDBOARD MAIN LANES
- PROPOSED MIDBOARD MAIN LANES, CD ROADS, & RAMPS
- PROPOSED DIRECT CONNECTOR
- PROPOSED FRONTAGE ROAD
- PROPOSED BRIDGE
- PROPOSED SIDEWALK
- EXISTING FEATURES
- EXISTING HAZMAT TRAP TO REMAIN
- EXISTING HAZMAT TRAP TO BE REMOVED
- EXISTING GRASSY SWALE TO REMAIN
- EXISTING GRASSY SWALE TO BE REMOVED
- PROPOSED GRASSY SWALE
- EXISTING WFS TO REMAIN
- EXISTING WFS TO BE REMOVED
- PROPOSED WFS
- EXISTING POND TO REMAIN
- PROPOSED SAND FILTER POND
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- 100-YR ITEM FLOODPLAIN
- EXISTING GRASSY SWALE DRAINAGE AREA
- PROPOSED GRASSY SWALE AREA
- EXISTING WFS DRAINAGE AREA
- PROPOSED WFS DRAINAGE AREA
- EXISTING POND TO REMAIN DRAINAGE AREA
- PROPOSED SAND FILTER POND AREA
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- PROPOSED OUTFALL DRAINAGE BOUNDARY

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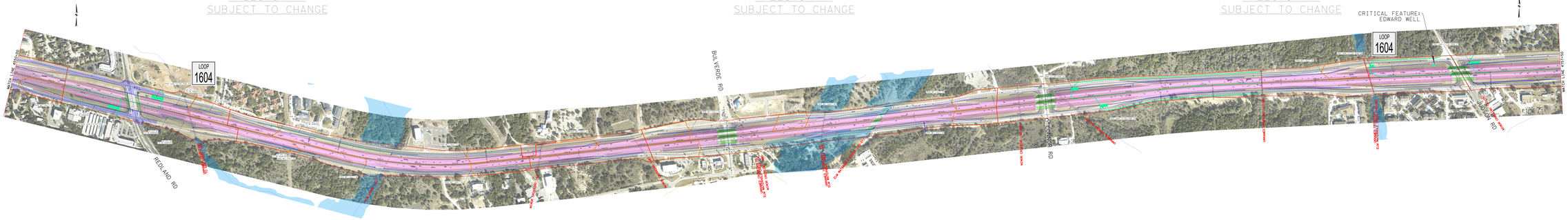
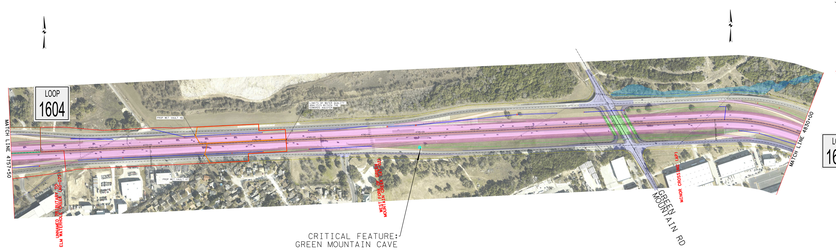
ENGINEER: DAISY ESQUIVEL, PE
P.E. SERIAL NO.: 110031
DATE: 5/27/2020

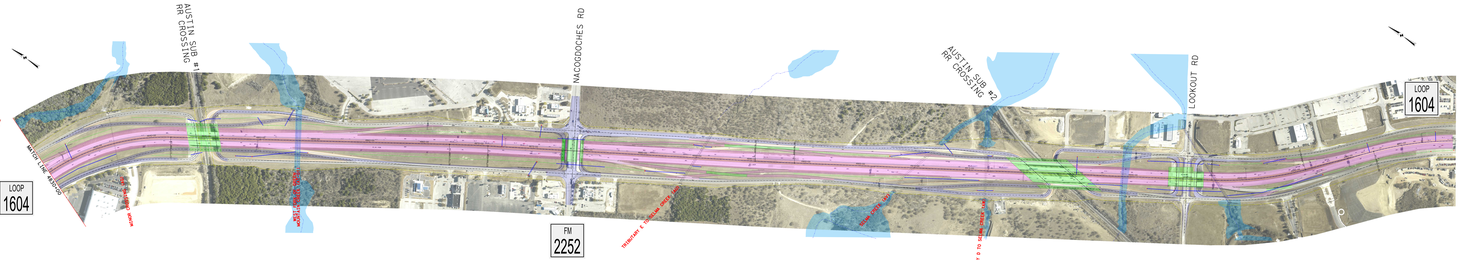
PRELIMINARY
SUBJECT TO CHANGE

PRELIMINARY
SUBJECT TO CHANGE

PRELIMINARY
SUBJECT TO CHANGE







SCALE 1" = 200'

AECOM

Texas Department of Transportation

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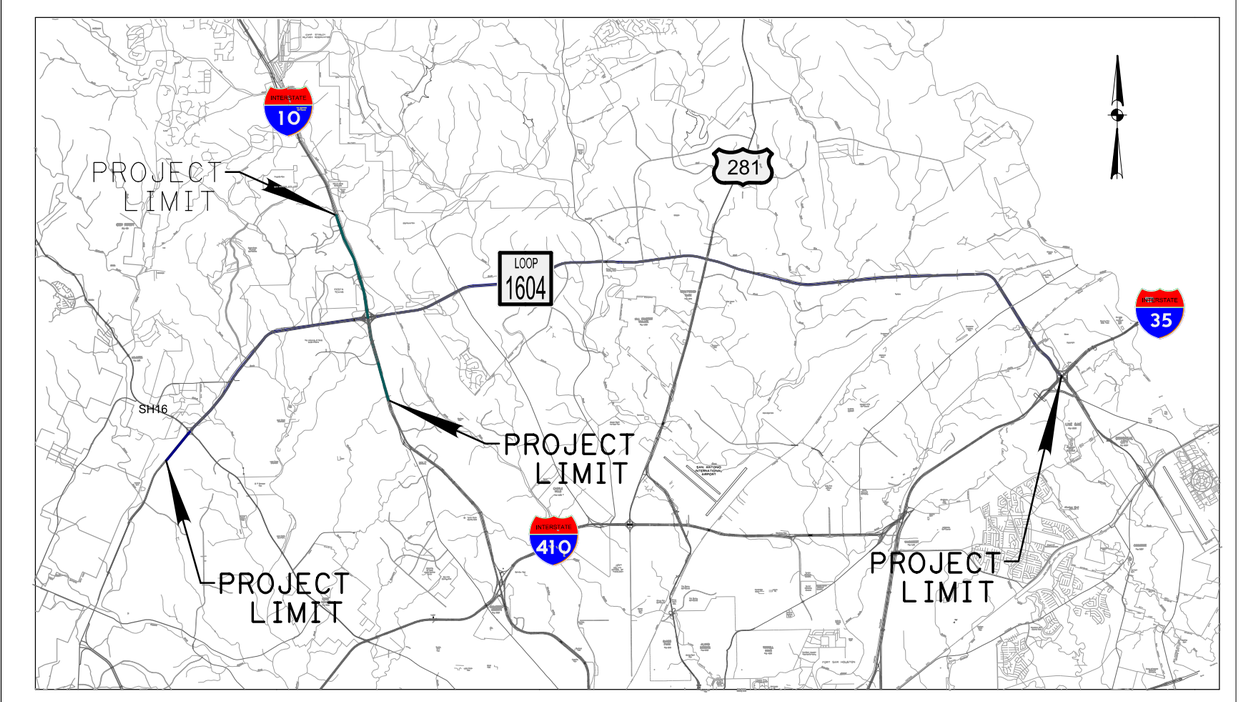
EXHIBIT B: PROPOSED WATER QUALITY BMPS

LOOP 1604

PROJECT LOCATION MAP



PART 1 OF 1

CONTROL: 2452 SECTION: 02 JOB: 083

TEXAS DEPARTMENT OF TRANSPORTATION

CONCEPTUAL SCHEMATIC LAYOUT

LOOP 1604

BEXAR COUNTY

IH 10:

LIMITS: FROM CAMP BULLIS ROAD TO UTSA BLVD
LENGTH: 4.4 MILES
FUNCTIONAL CLASS: INTERSTATE

LOOP 1604:

LIMITS: FROM SH 16 TO I-35
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OFFICE OF THE DISTRICT ENGINEER

SAN ANTONIO, TEXAS

LEGEND

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- VFS VEGETATIVE FILTER STRIP
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COLOR LEGEND

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ENGINEER: DAISY ESQUIVEL, PE

P.E. SERIAL No.: 102031

DATE: 5/27/2020

SCALE: 1" = 200 FT HOR

0 100 200

3 / 4

FILE NAME:

0 100 200

SCALE: 1" = 200'